GATES LEARJET CORPORATION

maintenance manual

CHAPTER

55

STABILIZERS

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STABILIZERS - DESCRIPTION AND OPERATION

1. Description

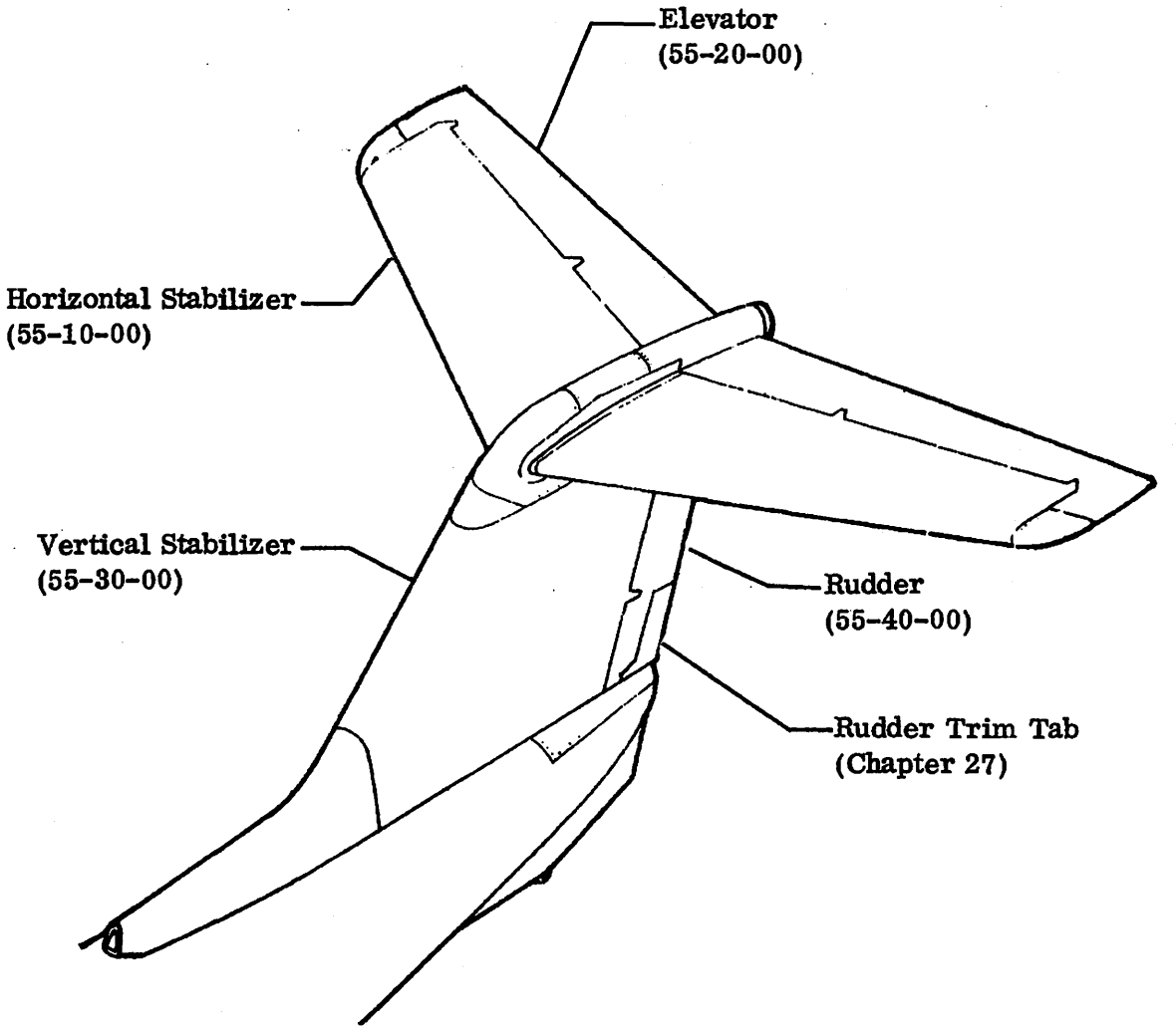
A. Stabilizers include the horizontal stabilizer, elevators, vertical stabilizer, and rudder.

B. The one-piece horizontal stabilizer is attached to the vertical stabilizer at two points. The aft attach point serves as a pivot and consists of a large pin inserted through heavy bearings in the horizontal and vertical stabilizers. The forward attach point attaches to the horizontal stabilizer actuator. The bottom of the actuator is secured to the vertical stabilizer forward spar. The horizontal stabilizer is constructed of spars and ribs covered with skin. Access covers on the bottom skin of the horizontal stabilizer provide access to the hinge points. For additional information on the horizontal stabilizer, refer to Chapter 27.

C. Each elevator is connected to the horizontal stabilizer at three hinge points. The elevator consists of ribs and spars covered with skin. Counterbalance weights are located in the leading edge of the tip cover. An access cover located on the leading edge of the elevator provides access to the center hinge point. For additional information on the elevator, refer to Chapter 27.

D. The vertical stabilizer structure consists of spars and ribs covered with skin. Access covers located on the vertical stabilizer provide access for structural inspection and access to electrical wiring, horizontal stabilizer actuator, elevator controls, and rudder hinges. Attach fittings for the rudder and horizontal stabilizer are located on the vertical stabilizer.

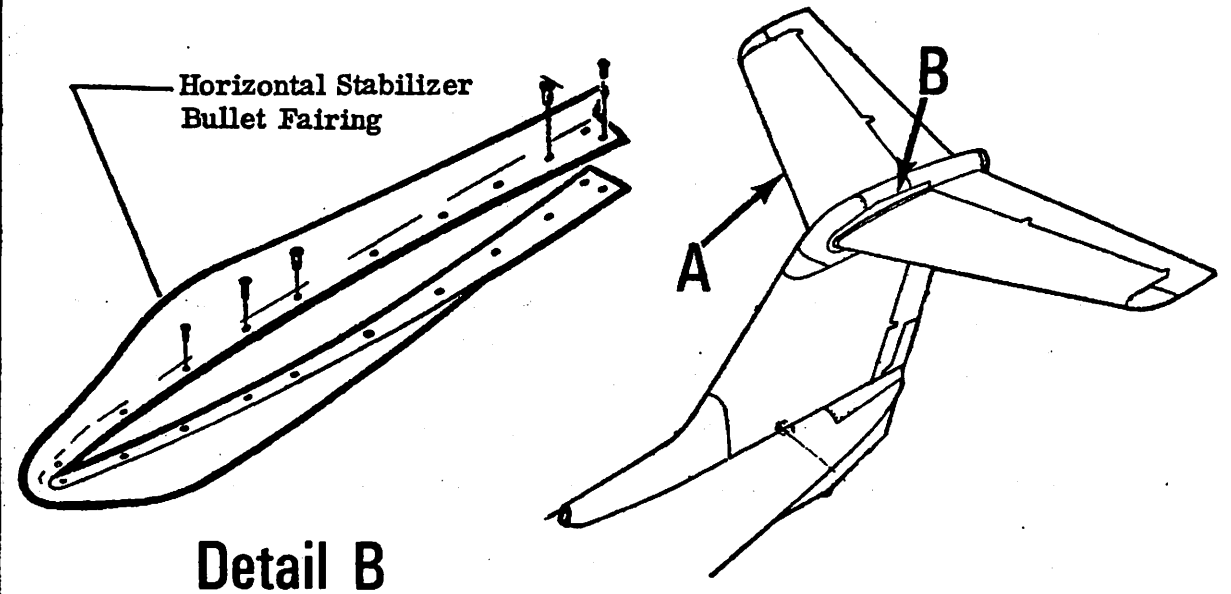
E. The rudder is mounted on a torque tube with a bellcrank attached to its lower end. The bellcrank provides attach points for the rudder control cables. Counterbalance weights are located in the rudder leading edge. A rudder trim tab is located on the rudder lower trailing edge and is controlled by an actuator located in the rudder leading edge. Access covers on the leading edge of the rudder provide access to the hinge points, balance weights, and trim tab actuator.



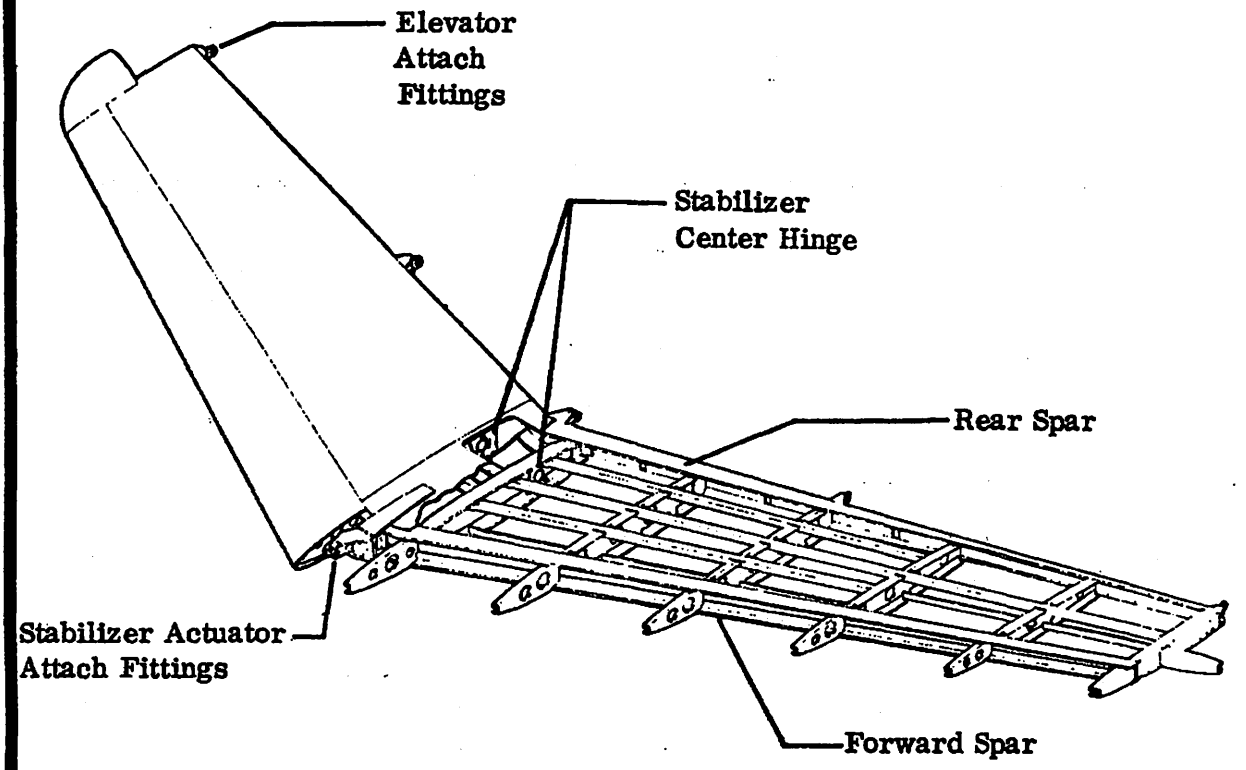
Stabilizers
Figure 1

HORIZONTAL STABILIZER - DESCRIPTION AND OPERATION

1. Description
 - A. The horizontal stabilizer is a one-piece unit constructed of spars and ribs covered with skin.
 - B. The horizontal stabilizer is attached to the upper portion of the vertical stabilizer and serves as a pitch trim controller.
 - C. The horizontal stabilizer has two attach points. The aft attach point serves as a pivot point and is attached to the vertical stabilizer with a large pin inserted through bearings. The forward attach point is attached to the arm of the horizontal stabilizer actuator and the actuator is attached to the forward spar of the vertical stabilizer.
 - D. A fiberglass bullet fairing is installed on each side of the horizontal stabilizer where it passes through the vertical stabilizer cutouts. The fairings cover the open area at the vertical stabilizer cutouts when the horizontal stabilizer is in the full up or down position.
 - E. The fiberglass fairings are coated with an anti-static coating to prevent buildup of static electricity on the non-conductive fairings.
 - F. Horizontal stabilizer position is controlled by the horizontal stabilizer actuator. (Refer to Chapter 27.)

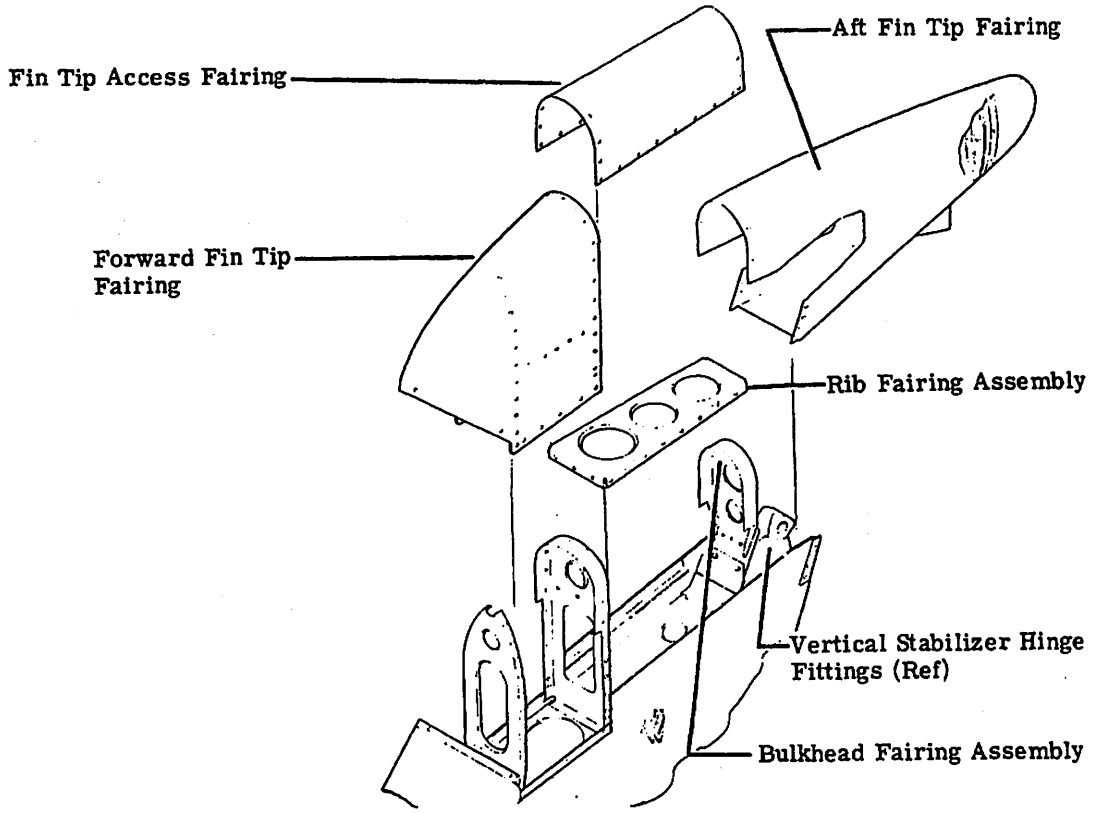


Detail B

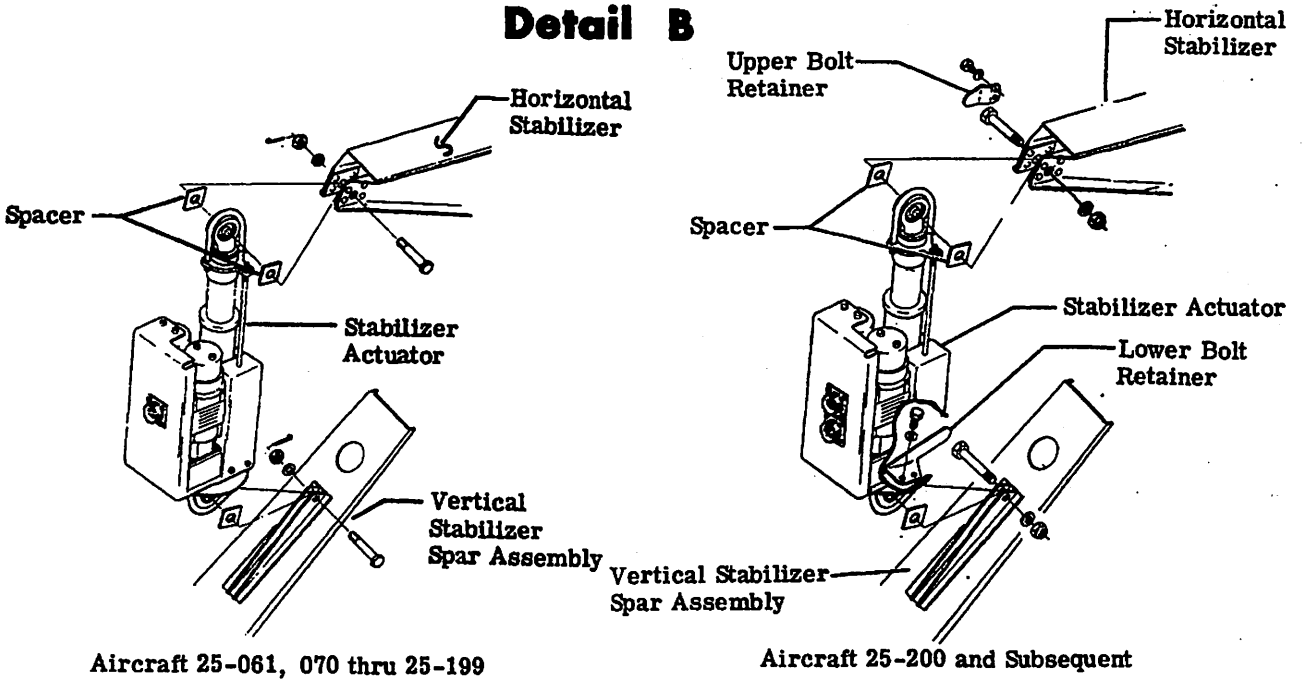


Detail A

Horizontal Stabilizer
Figure 1



Detail B



Aircraft 25-061, 070 thru 25-199

Aircraft 25-200 and Subsequent

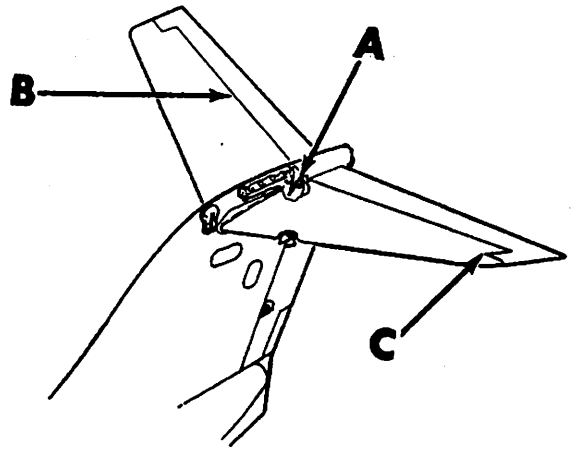
Detail C

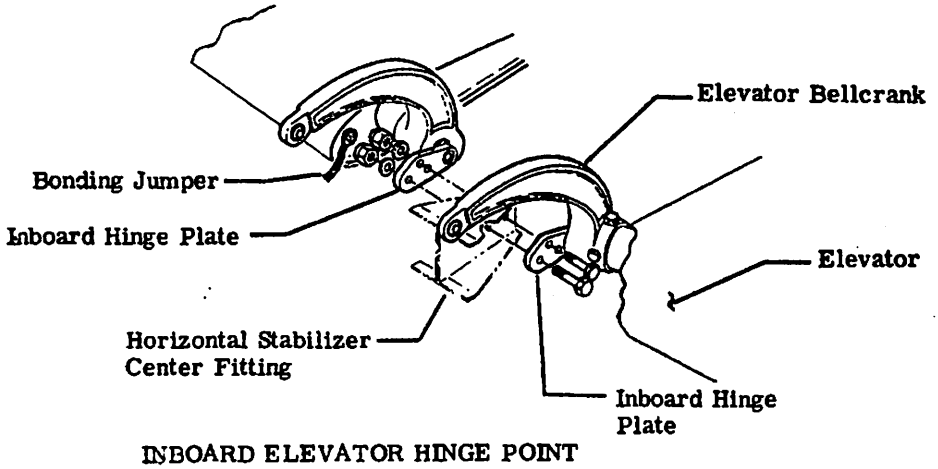
Horizontal Stabilizer
Figure 1 (Sheet 2 of 2)

EFFECTIVITY: ALL

ELEVATOR - DESCRIPTION AND OPERATION

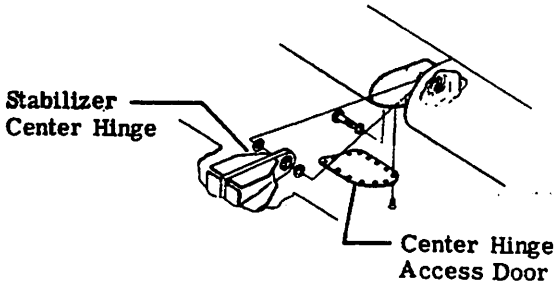
1. General
 A. The elevators provide longitudinal control of the aircraft. The elevators are controlled by push-pull tubes located in the vertical stabilizer. The push-pull tubes are connected to elevator bellcranks located inside the vertical stabilizer fairing. The bellcranks are connected to torque tubes which extend into the elevators. Access to the elevator control is through vertical stabilizer fairings and access covers.
 B. Each elevator is connected to the horizontal stabilizer at three hinge points. Access covers adjacent to the hinge points allow access to the hinge bolts.
 C. The elevators are constructed using the standard ribs and spars configuration. Each elevator contains a balance weight located in the outboard leading edge. The balance weights are accessible by removing the elevator tips.
 D. Bonding jumpers are connected between the vertical stabilizer and the inboard leading edge of the elevators. Static dischargers are located on the outboard trailing edge of the elevators.
 E. For additional information on the elevators, refer to Chapter 27.





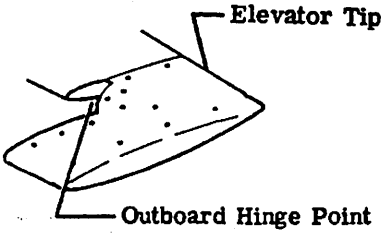
INBOARD ELEVATOR HINGE POINT

Detail A



CENTER ELEVATOR HINGE POINT

Detail B



ELEVATOR TIP AND OUTBOARD
HINGE POINT

Detail C

Elevators
Figure 1

ELEVATOR - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Elevator Tip Cover

(1) Remove screws from upper and lower surfaces of the elevator tip cover.

(2) Slide elevator tip cover straight out and off of the elevator.

(3) If a new tip cover is to be installed and the scupper and/or static discharger are to be reused, drill out rivets and remove scupper and/or static discharger.

NOTE: The static discharger is bonded to the surface and must be pried off.

B. Install New Elevator Tip Cover (See figure 201)

(1) Position tip cover over the end of the elevator and push on to the elevator as far as possible.

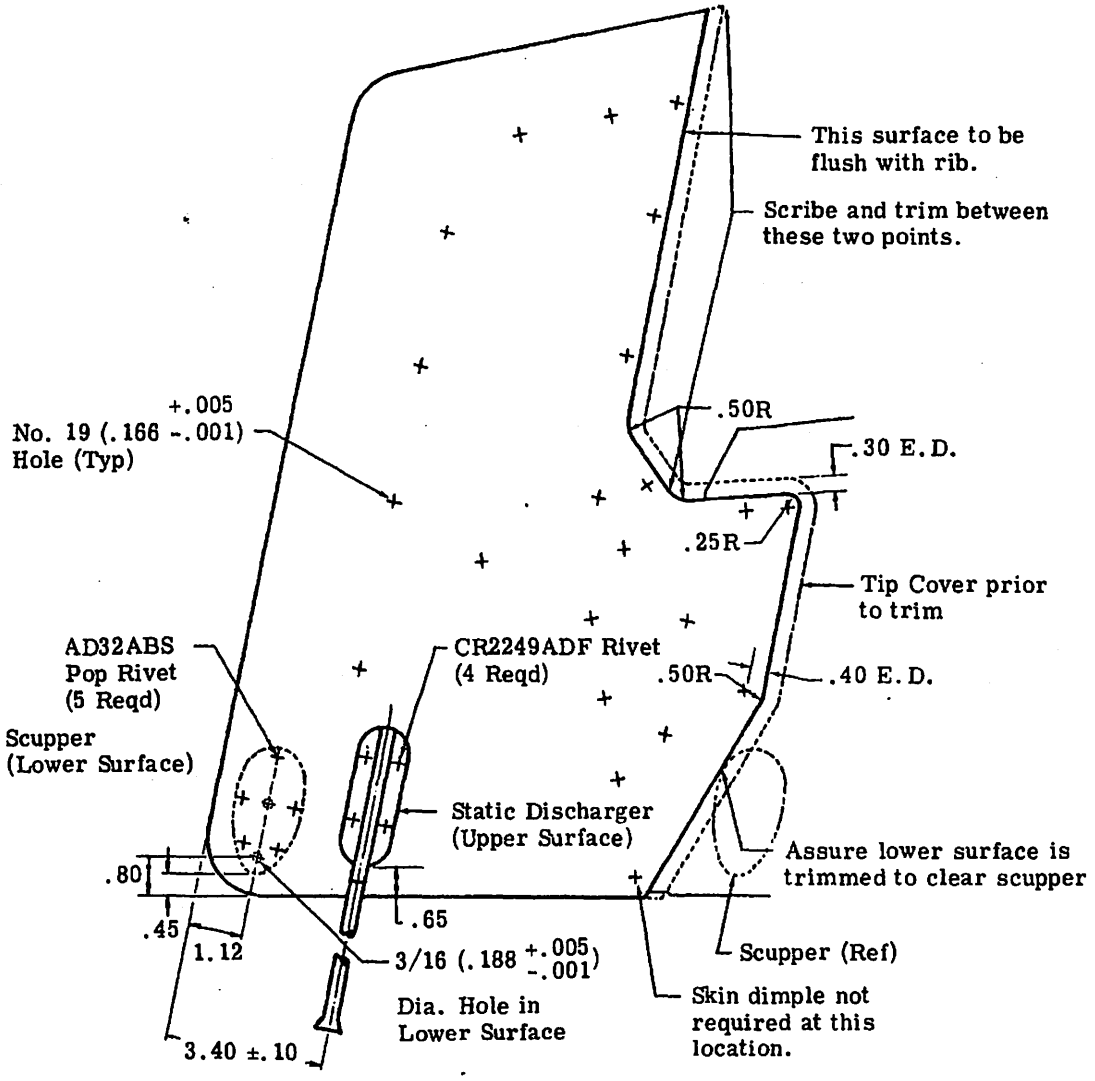
NOTE: The open end of the tip cover will have to be spread slightly to go completely onto the elevator ribs. The tip cover will probably protrude past the rib and overlap the scupper on the elevator.

(2) Using a hole finder, locate as many holes in the tip cover as possible assuring the holes are located on center.

NOTE: There are three basic methods of locating the remaining holes. One method is to place a sheet of heavy mylar or clear plastic over the elevator rib structure and mark the hole locations on the mylar. The mylar is then transferred to the tip cover and aligned with the holes previously located. After locating the mylar on the tip cover, pilot holes are drilled into the tip cover through the mylar. The second method of locating the holes is by using the old tip cover, if it is not damaged too severely. The old tip cover may be cut in half, carefully aligned on the new tip cover, and used as a template to locate the holes. The third method is to locate several holes, using a hole finder, remove the tip cover, measure the hole locations in the rib structure and transfer the measurements to the tip cover.

(3) After all holes have been located, final drill using a No. 19 (.166 +.005/-.001) drill.

(4) Excluding the hole located at the inboard most trailing edge of the tip cover, dimple all holes .329-.339 Dia. x 100°.



Elevator Tip Cover Installation
Figure 201

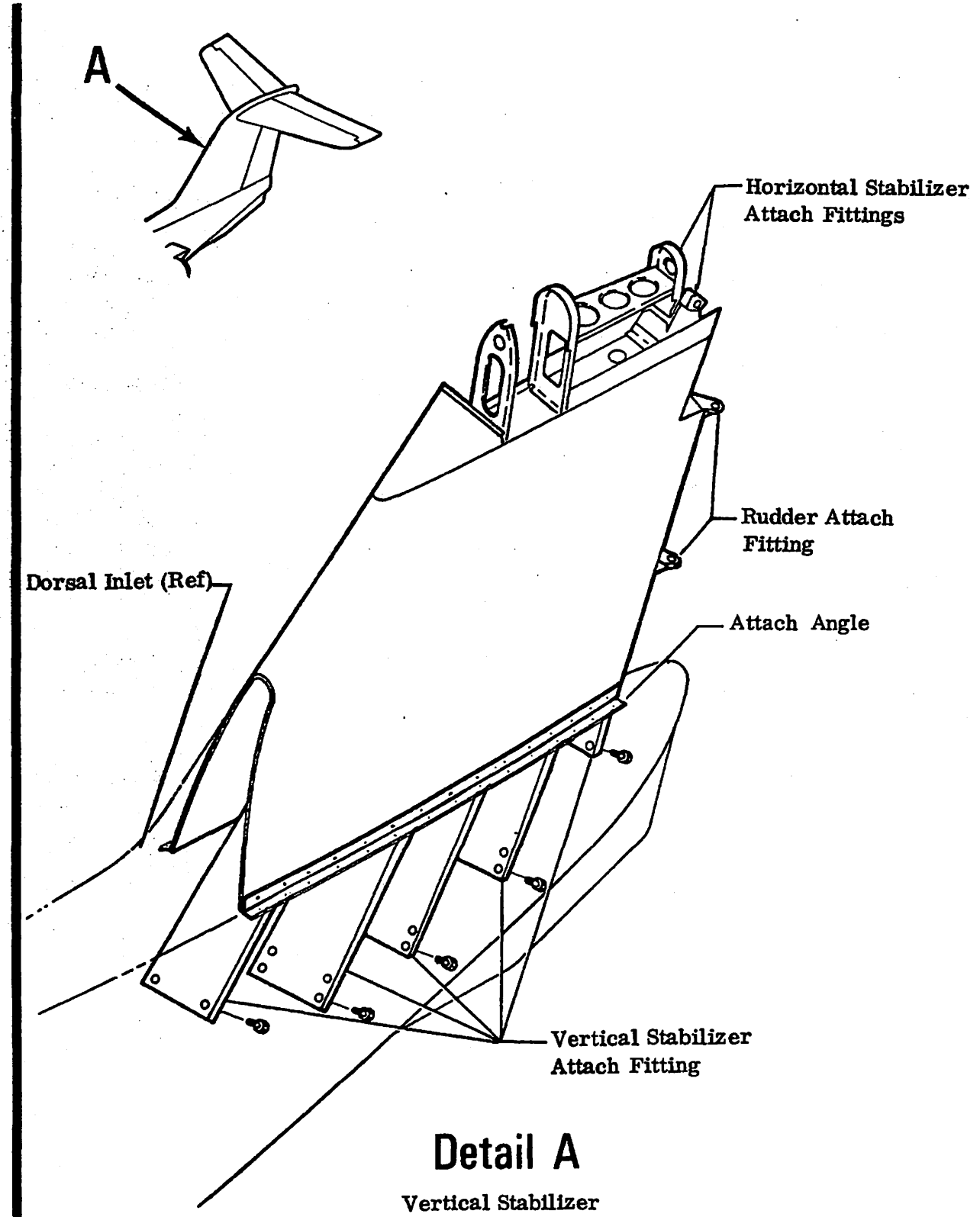
(5) Position tip cover on elevator and align holes. Secure with several screws on both the upper and lower surface.
(6) Scribe a line on the inside of the tip cover along the rib at the forward inboard portion of the tip cover. This line should follow the rib down to and along the elevator hinge bracket.
(7) Remove tip cover and trim along the scribe line. Reinstall tip cover and check to see that it is flush with rib and hinge bracket.
(8) Trim and radius the remaining portion of the inboard side of the tip cover to obtain correct edge distance as shown in figure 201.

NOTE: If the elevator is painted, the paint line where the old tip cover was, may be used as a trim guide.

(9) Locate and drill drain hole on lower surface as shown in figure 201.
(10) Locate scupper on lower surface as shown in figure 201. Drill holes and secure scupper with AD32ABS pop rivets.
(11) Locate static discharger base on upper surface as shown in figure 201. Install static discharger in accordance with 23-60-00.
(12) Install elevator tip and secure with screws.
(13) Paint tip cover. Refer to 20-50-00.
(14) Check elevator overbalance. Refer to 27-00-00.

VERTICAL STABILIZER - DESCRIPTION AND OPERATION

1. Description
 - A. The vertical stabilizer is a fully-cantilevered structure consisting of spars and ribs covered with skin. The lower leading edge of the vertical stabilizer is faired into the fuselage by the dorsal inlet which is made of fiberglass and provides ram air for the heat exchanger.
 - B. Removable fairings are located at the upper tip of the vertical stabilizer. The fairings provide access to the horizontal stabilizer actuator, inboard elevator hinge fitting, navigation light electrical wiring, and horizontal stabilizer rigging plate. Access covers are located on the RH and LH sides of the vertical stabilizer and provide access to electrical wiring, lower horizontal stabilizer actuator attach point, elevator downspring assembly, and elevator controls.
 - C. Navigation light and horizontal stabilizer actuator wiring is also routed through the vertical stabilizer.
 - D. Attach fittings on the vertical stabilizer consist of a lower attach point for the horizontal stabilizer actuator, and hinge fittings for the horizontal stabilizer and the rudder.
 - E. The vertical stabilizer is attached to the tailcone by attaching the stabilizer spars to the tailcone bulkheads and by an attach angle on each side of the stabilizer that is riveted to the tailcone.



Detail A

Vertical Stabilizer
Figure 1

RUDDER - DESCRIPTION AND OPERATION

1. Description

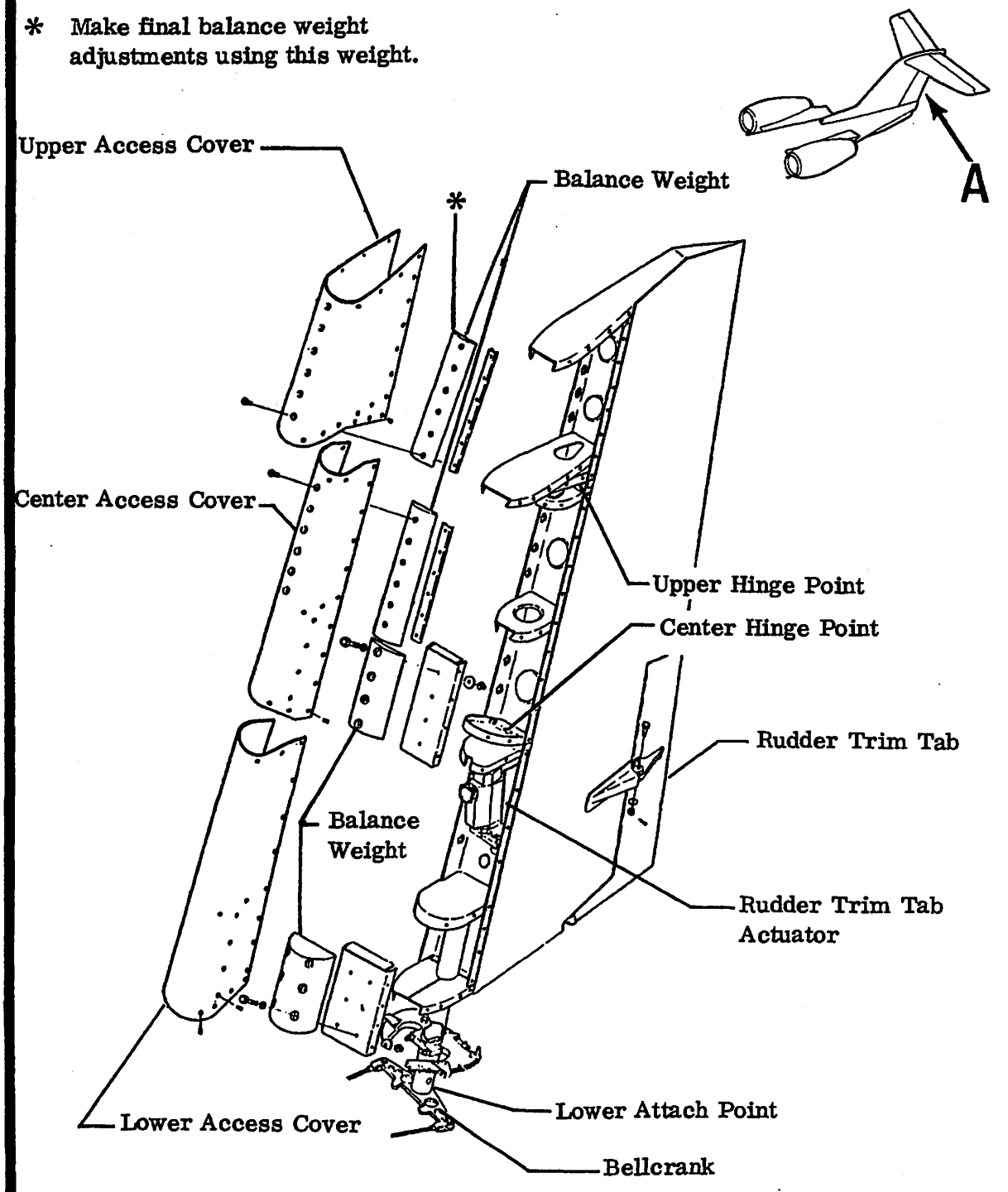
A. The rudder is attached to the vertical stabilizer at two hinge points. A third hinge point is located in the tailcone below the vertical stabilizer.

B. The rudder structure is made up of spars and ribs covered with skin. A torque tube extends out the lower end of the rudder. The lower enc of the torque tube fastens to the lower hinge point and has a bellcrank attached. Balance weights are located in the rudder leading edge.

C. A rudder trim tab is attached to the rudder trailing edge by a piano-type hinge. A push-pull tube attaches the trim tab to an electrical actuator located in the rudder leading edge. The lower leading edge of the trim tab contains balance weights.

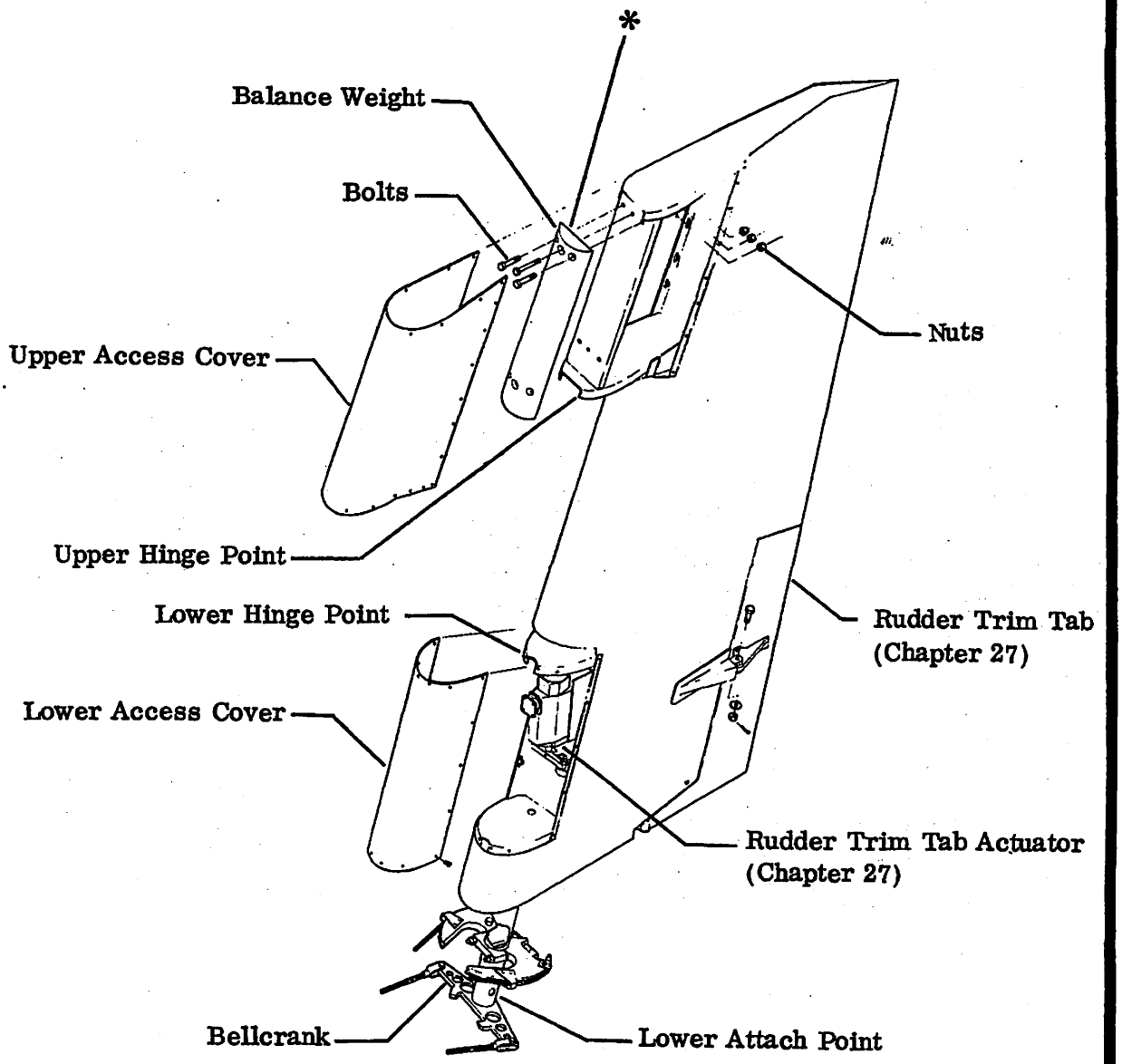
D. Access covers on the rudder leading edge provide access to the balance weights, hinge bolts and trim tab actuator.

E. For additional information on the rudder and trim tab, refer to Chapter 27.



Detail A

Rudder Assembly
Figure 1 (Sheet 1 of 2)



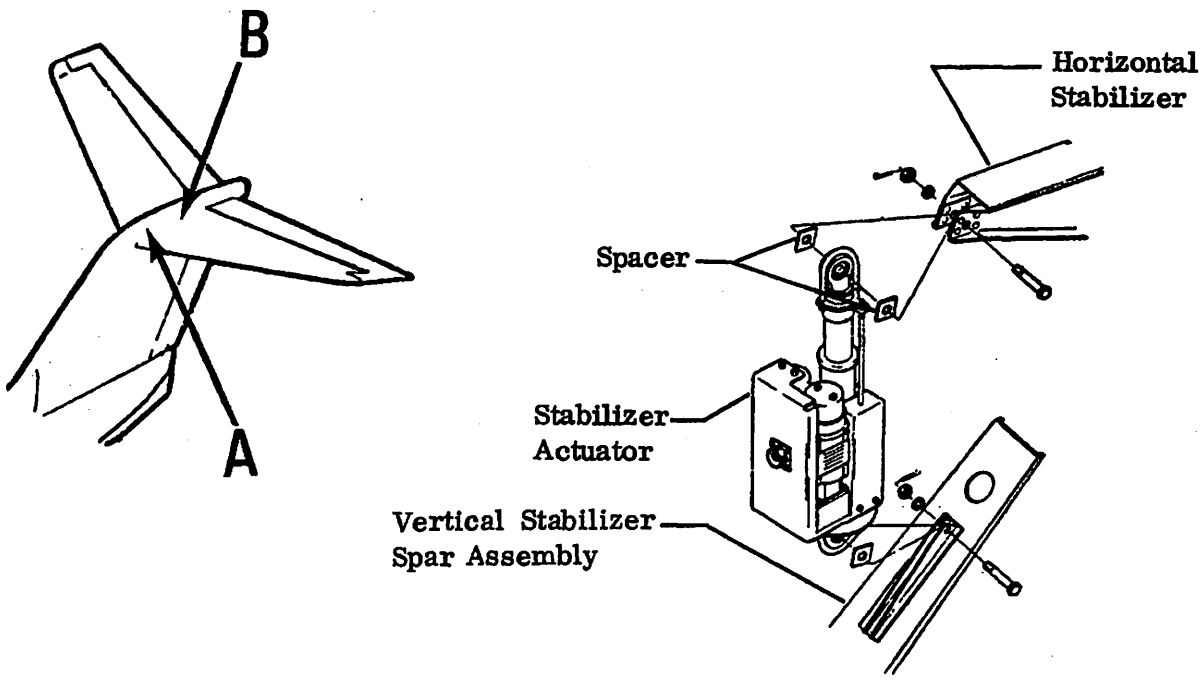
Detail A

* Make final balance weight adjustment using this weight.

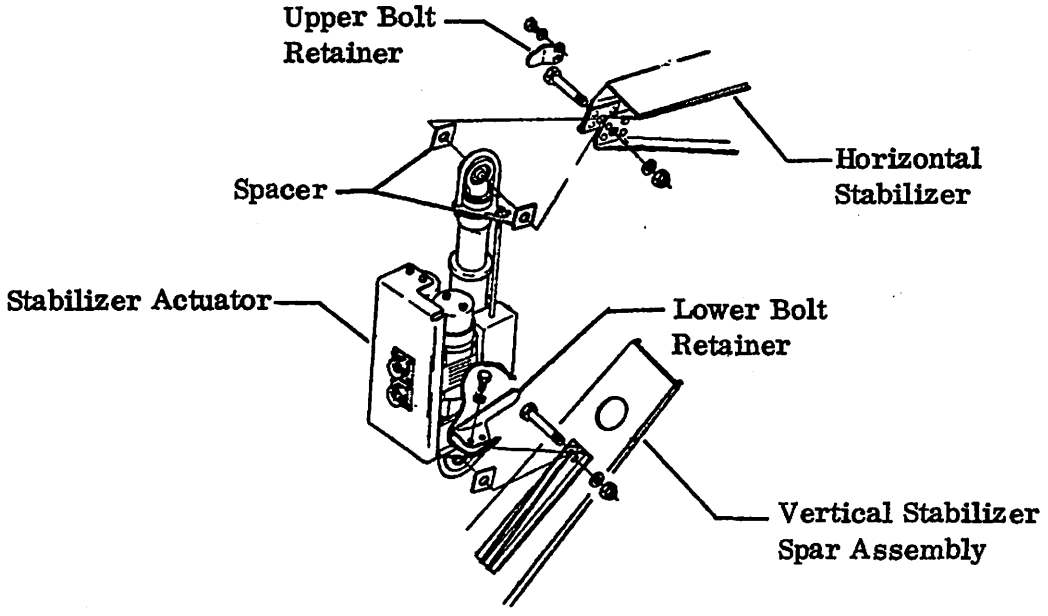
Rudder Assembly
Figure 1 (Sheet 2 of 2)

ATTACH FITTINGS - DESCRIPTION AND OPERATION

1. Description
 A. Stabilizer attach fittings consist of fittings in the vertical and horizontal stabilizers for attachment of the horizontal stabilizer, rudder, rudder trim tab, and elevators.
 B. One attach fitting for the horizontal stabilizer is located on the forward spar of the vertical stabilizer and the other at the upper trailing edge of the vertical stabilizer. The aft attach point serves as a pivot point for the movable horizontal stabilizer and consists of a large hinge pin inserted through heavy bearings in the horizontal stabilizer and vertical stabilizer. The forward attach point is to a heavy-duty electrical actuator. The bottom end of the actuator is secured to the vertical stabilizer forward spar with a bolt and nut. The upper end of the actuator is attached by a bolt and nut to a fitting on the horizontal stabilizer. For horizontal stabilizer removal and installation, refer to Chapter 27.
 C. Attach fittings for the elevators are located on the rear spar of the horizontal stabilizer. The inboard attach point consists of a bearing block secured to the horizontal stabilizer and inserted into the elevator torque tube. The center and outboard hinge points consist of a bracket and a bearing to which the elevator hinge points consist of a bracket and a bearing to which the elevator is secured with a bolt and nut. For elevator removal and installation, refer to Chapter 27.
 D. Two attach fittings for the rudder are located on the vertical stabilizer rear spar and one in the tailcone below the vertical stabilizer. The attach points on the vertical stabilizer spar consist of a bracket and bearing. The lower end of the rudder torque tube sits on a bearing block and is secured by a bolt. For rudder removal and installation, refer to Chapter 27.
 E. Attach fittings for the rudder trim tab consist of a piano-type hinge attached to the lower trailing edge of the rudder. For rudder trim tab removal and installation, refer to Chapter 27.
 F. Attach points for the vertical stabilizer consist of the spars that are attached to the tailcone bulkheads and an attach angle on each side of the vertical stabilizer that is riveted to the tailcone. For vertical stabilizer removal, refer to Chapter 27.



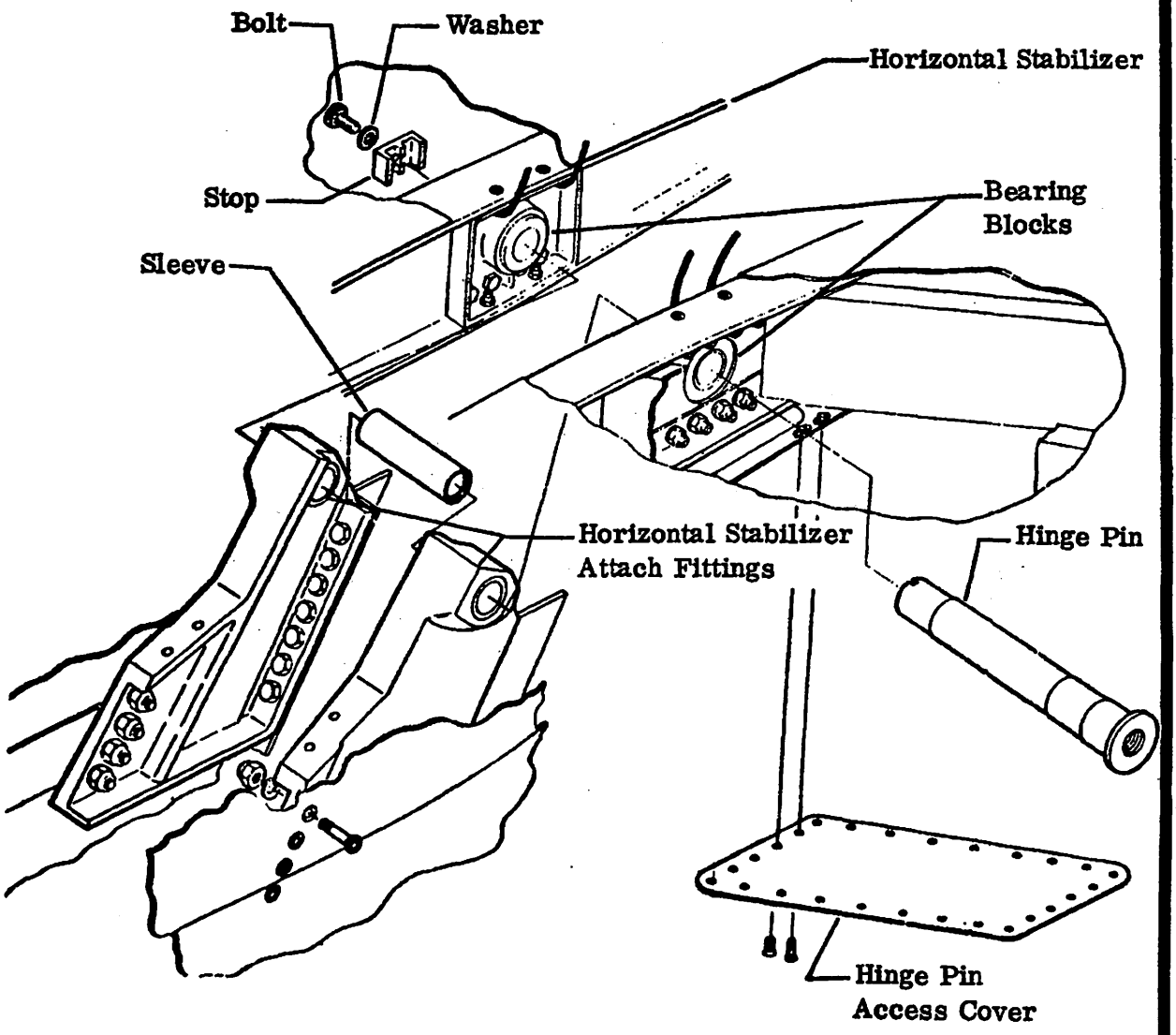
Aircraft 25-061, 070 thru 25-199



Aircraft 25-200 and Subsequent

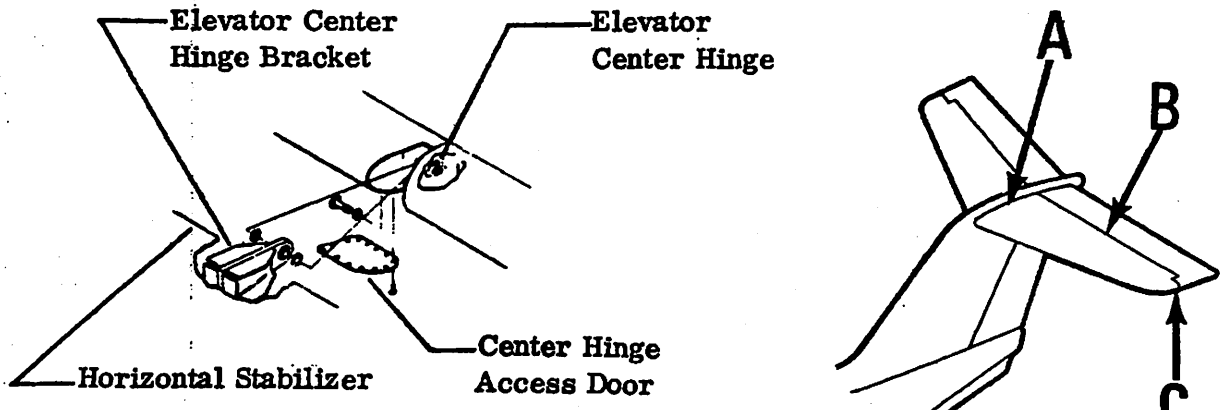
Detail A

Horizontal Stabilizer Attach Fittings
Figure 1 (Sheet 1 of 2)



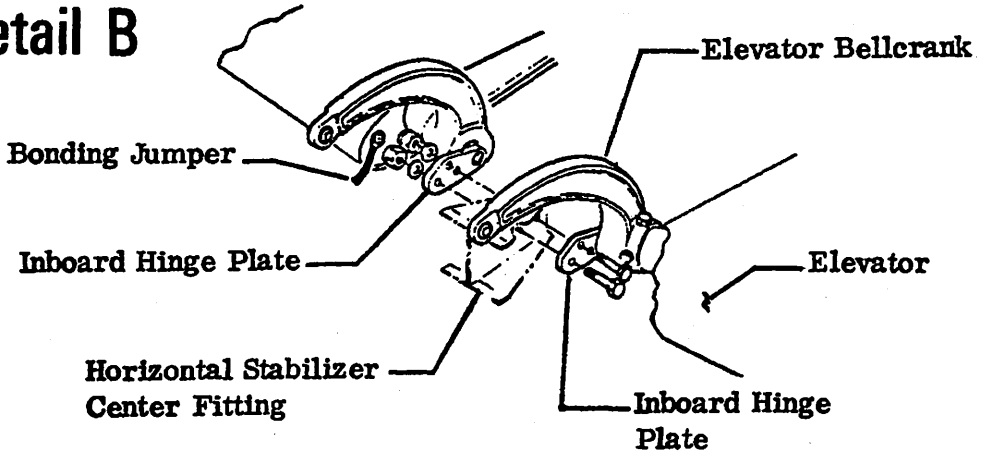
Detail B

Horizontal Stabilizer Attach Fittings
Figure 1 (Sheet 2 of 2)



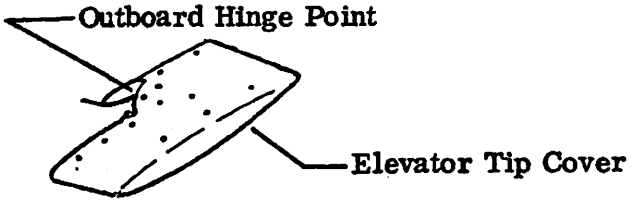
CENTER ELEVATOR HINGE POINT

Detail B



INBOARD ELEVATOR HINGE POINT

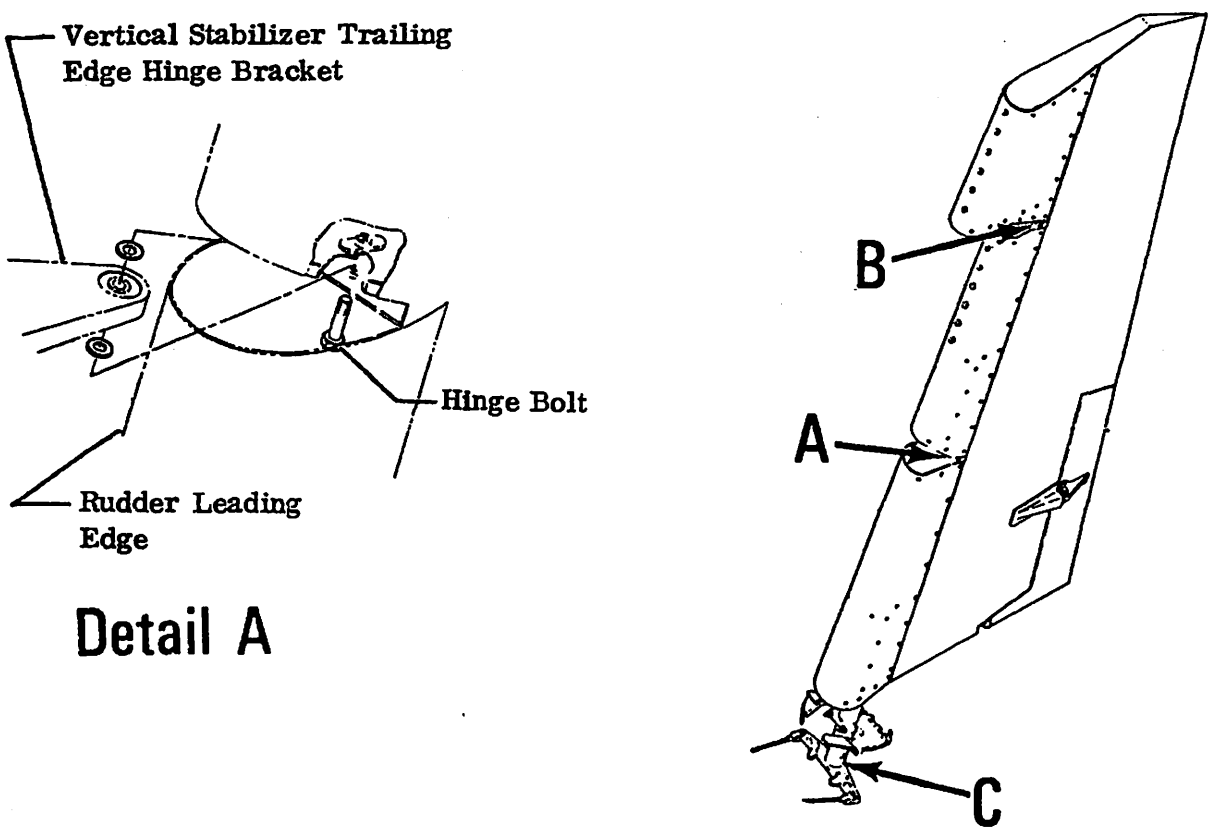
Detail A



ELEVATOR TIP AND OUTBOARD HINGE POINT

Detail C

Elevator Attach Fittings
Figure 2



Rudder Attach Fittings
Figure 3

HORIZONTAL STABILIZER ATTACH FITTING - APPROVED REPAIRS

1. APPROVED REPAIRS

NOTE: Maintenance personnel should read this complete set of instructions and become thoroughly familiar with tool part numbers and their functions prior to beginning rework procedures.

A. Tools and Equipment

NAME	NUMBER	MANUFACTURER	USE
Bushing Reamer Tool Set	FCT 34379	Gates Learjet Corp.	Install and ream bushings.
Rivet Gun, 5X			Remove and install bushings.
Bucking Bar		Procure locally	Fitting backup
Dry Ice		Procure locally	Cold soak bushings
Methyl Alcohol (Methanol)		Procure locally	Cold soak bushings
Zinc Chromate Primer		Procure locally	Prime fitting holes

B. Remove Bushings

(1) Remove horizontal stabilizer. (Refer to Chapter 27.)

(2) Remove LH and RH bushings from horizontal stabilizer attach fittings using removal tools P/N FCT 34379-7 (LH) and FCT 34379-8 (RH) and a rivet gun with driving tool FCT 34379-13. Back up fittings with an acceptable bucking bar while driving out bushings.

C. Inspect Fitting Holes (See figures 201 and 203.)

(1) Inspect hole diameter in attach fittings. Tolerance for LH fitting hole diameter is 1.2500 (+0.0005, -0.0000) inches. Tolerance for RH fitting hole diameter is 1.1875 (+0.0005, -0.0000) inches. If either hole is out of tolerance, contact GLC Field Service Department for instructions.

D. Install LH Bushing (See figure 201.)

(1) Place new bushings in an alcohol/dry ice mixture for a minimum of 20 minutes.

(2) Prime hole in LH fitting with zinc chromate primer just prior to installing new bushing.

(3) Position FCT 34379-9 guide pin in RH fitting with threaded end toward LH fitting.

(4) Slide cold-soaked LH bushing onto FCT 34379-7 driving plug and thread -9 pin into -7 plug to properly align bushing in LH fitting.

(5) Drive LH bushing into fitting (within 14 seconds after removing bushing from alcohol/dry ice mixture) using a 5X rivet gun with FCT 34379-13 driving tool.

NOTE: The bushing is to be flush with the outboard surface of the elevator attach fitting within ±0.002 inch. (See figure 202.)

E. Ream LH Bushing (See figure 202.)

(1) Install FCT 34379-2 tool guide into RH fitting with shank of FCT 34379-11 reamer in tool guide.
(2) Ream LH bushing through with -11 reamer using FCT 34379-5 handle for turning reamer. Apply adequate lubricant while reaming.
(3) Remove -11 reamer from tool guide.
(4) Ream LH bushing through again using FCT 34379-1 reamer in -2 tool guide. Apply adequate lubricant while reaming.
(5) Remove -1 reamer and -2 tool guide from RH fitting.
(6) Inspect reamed LH bushing inside diameter. Tolerance for reamed LH bushing ID is 1.0937 (+0.0005, -0.0000) inches. If bushing ID is out of tolerance, contact GLC Field Service Department for instructions.

F. Install RH Bushing (See figure 203.)

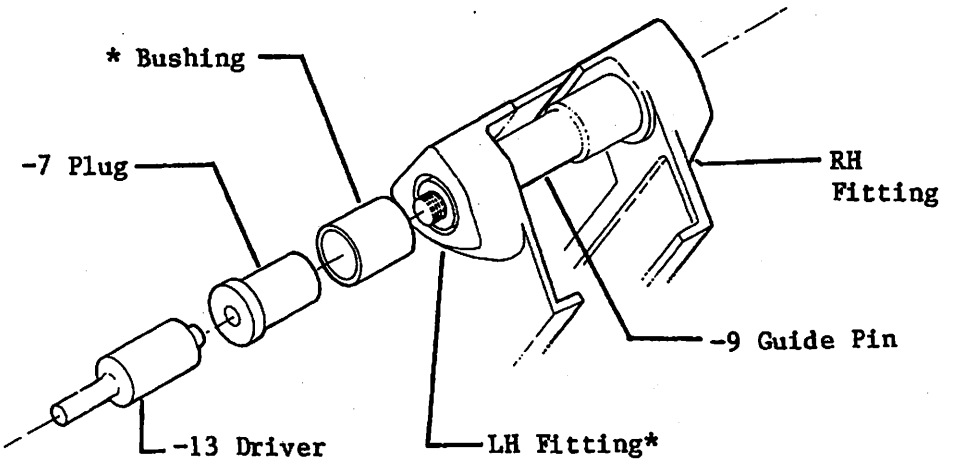
(1) Prime hole in RH fitting with zinc chromate primer just prior to installig new bushing.
(2) Position FCT 34379-10 guide pin in LH bushing with threaded end toward RH fitting.
(3) Slide cold-soaked RH bushing onto FCT 34379-8 driving plug and thread -10 pin into -8 plug to properly align bushing in RH fitting.
(4) Drive RH bushing into fitting (within 14 seconds after removing bushing from alcohol/dry ice mixture) using a 5X rivet gun with FCT 34379-13 driving tool.

NOTE: The bushing is to be flush with the outboard surface of the elevator attach fitting within ±0.002 inch. (See figure 204.)

G. Ream RH Bushing (See figure 204.)

(1) Install FCT 34379-4 tool guide into LH bushing with shank of FCT 34379-12 reamer in tool guide.
(2) Ream RH bushing through with -12 reamer using FCT 34379-5 handle for turning reamer. Apply adequate lubricant while reaming.
(3) Remove -12 reamer from tool guide.
(4) Ream R bushing through again using FCT 34379-3 reamer in -4 tool guide. Apply adequate lubricant while reaming.
(5) Remove -3 reamer and -4 tool guide from LH bushing.
(6) Inspect reamed RH bushing inside diameter. Tolerance for reamed RH bushing ID is 1.0312 (+0.0005, -0.0000) inches. If bushing ID is out of tolerance, contact GLC Field Service Department for instructions.

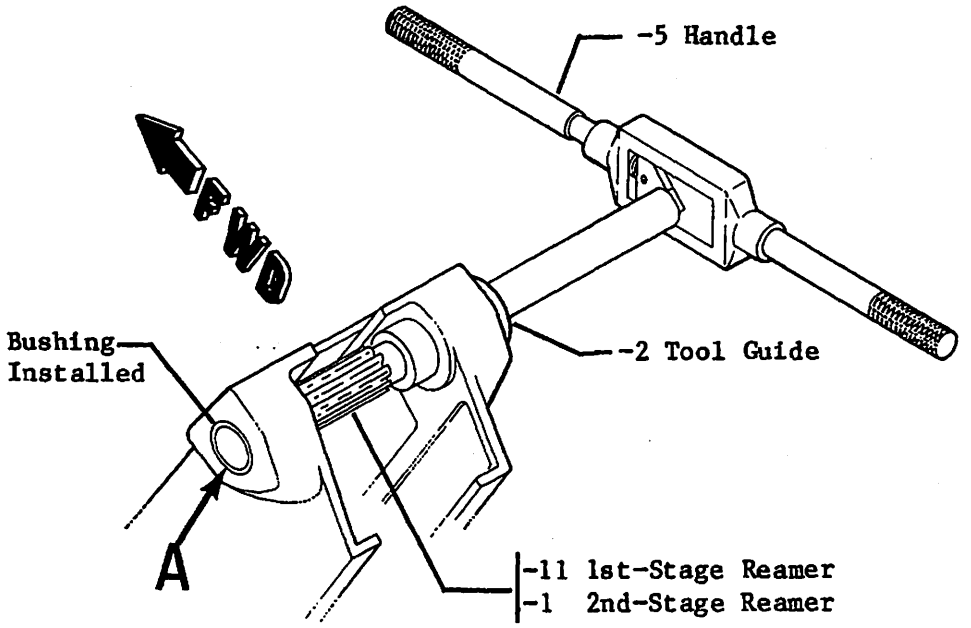
H. Install Horizontal Stabilizer (Refer to Chapter 27.)



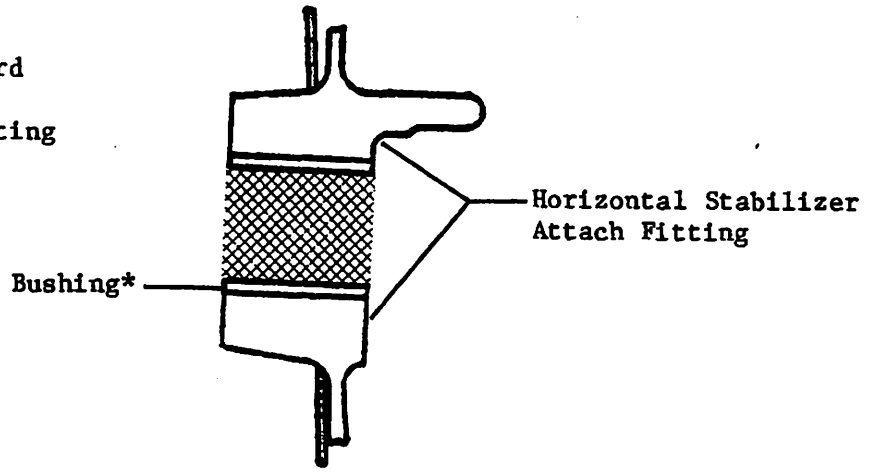
*Tolerance for LH fitting hole diameter is 1.2500 (+0.0005, -0.0000) inch. Apply zinc chromate primer to fitting immediately prior to installing cold-soaked bushing.

5-30C

Horizontal Stabilizer Attach Fitting LH Bushing Installation
Figure 201



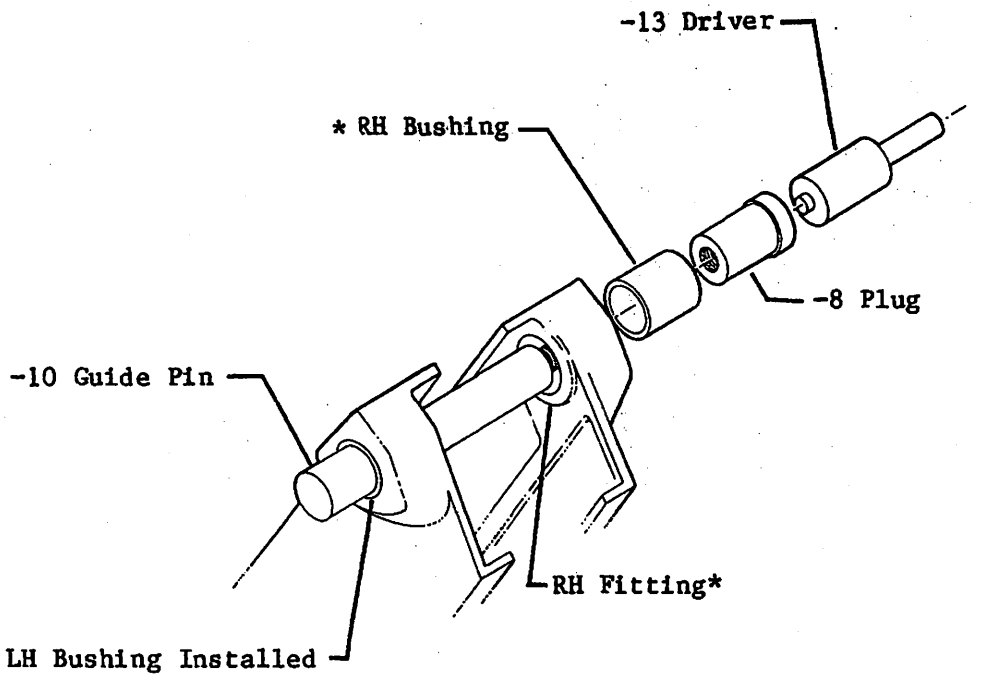
*Bushing outboard edge is to be flush with fitting ±0.002 inch.



5-30C

Detail A

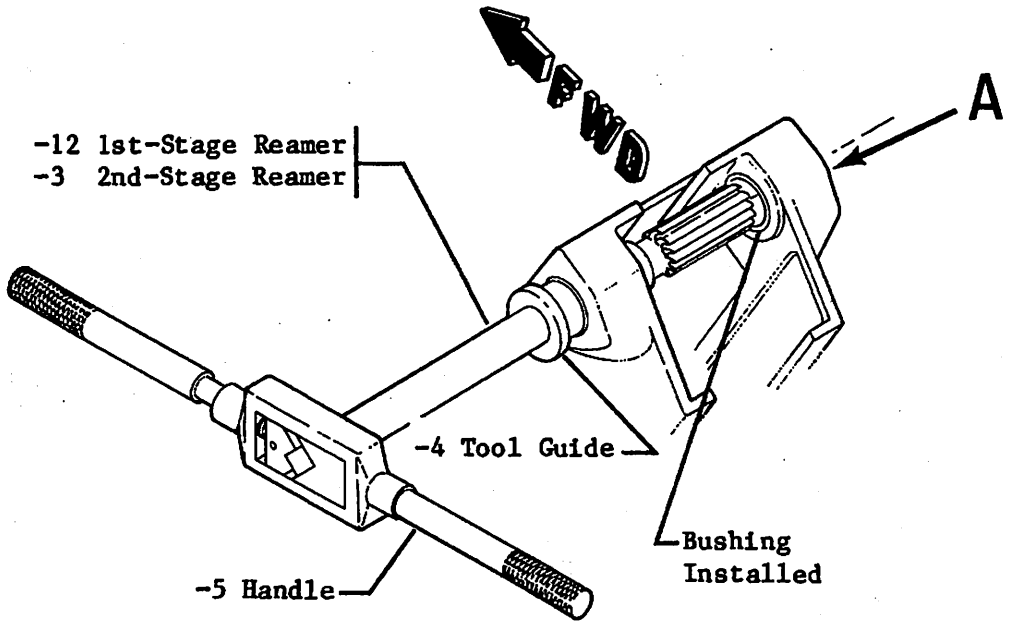
Horizontal Stabilizer Attach Fitting Reaming LH Bushing
Figure 202



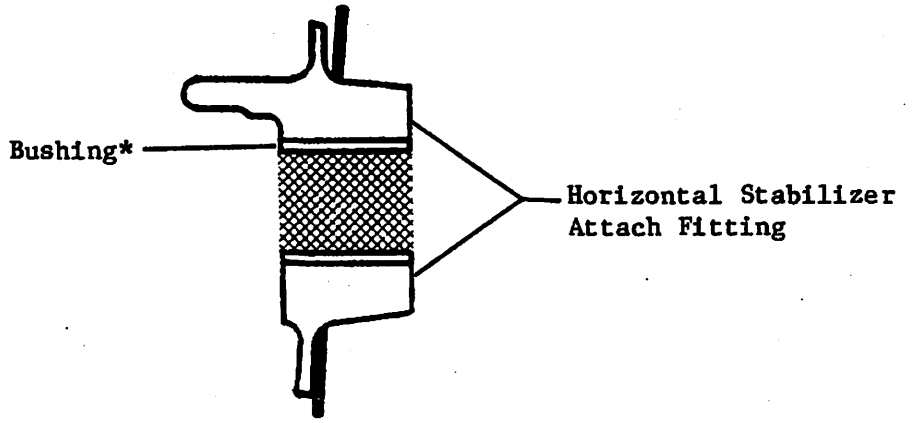
*Tolerance for RH fitting hole diameter is 1.1875 (+0.0005, -0.0000) inch. Apply zinc chromate primer to fitting immediately prior to installing cold-soaked bushing.

5-30C

Horizontal Stabilizer Attach Fitting RH Bushing Installation
Figure 203



*Bushing outboard edge is to be flush with fitting ±0.002 inch.



Detail A

5-30C

Horizontal Stabilizer Attach Fitting Reaming RH Bushing
Figure 204